BLE012
(Based on CSR1012)

Bluetooth Modules

User's Manual

V1.2

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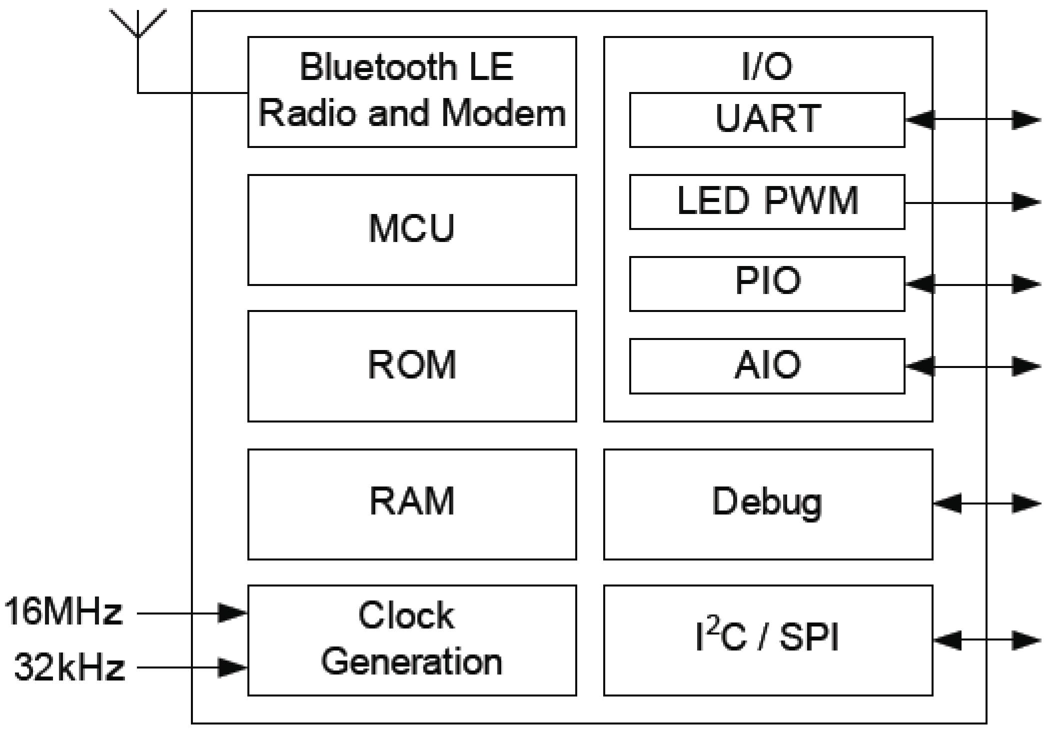
1 Introduction and Block Diagram

1.1 General Introduction

BLE012 (based on CSR1012) is a Bluetooth 4.1 BLE modules which is a high performance, cost effective, low power. The Bluetooth Low Energy module provides a complete 2.4GHz Bluetooth system based on CSR1012 chip which is a single chip data transfer and baseband IC for Bluetooth 2.4GHz systems. This module is fully compliant to Bluetooth 4.1 BLE

BLE012 is fully compliant to Bluetooth v4.1 specification with only firmware update in the future.

1.2 Block Diagram



2 Main Features and Application

2.1 Key Feature

- Fully Qualified Bluetooth v4.1 BLE System.
- 128KB memory, 64K RAM and 64K ROM
- 9dBm Bluetooth low energy max TX output power
- -92.5dBm Bluetooth low energy RX sensitivity
- Support for Bluetooth V4.1 specification host stack including ATT,GATT,SMP,L2CAP,GAP
- RSSI monitoring for proximity applications
- <900nA current consumption in dormant mode
- RoHS Compliant

2.2 Application

- Building an ecosystem using Bluetooth low energy
- Human Interface Devices(HID): keyboards, mice,touchpads,romote controls
- Sports and fitness sensors:heart rate, runner speed and cadence, cycle speed and cadence
- Health sensors: blood pressure, thermometer and glucose meters
- Mobile accessories: watches, proximity tags, alert tags and camera controls
- Smart home: heating control and lighting control
- Mesh application for Smart Home

3 Technical Specifications

3.1 General Specification

Number	Items	Description
1	Bluetooth Standard	Bluetooth v4.1 Standard
2	Chipset	CSR CSR1012
3	Dimension	15mm x 8mm x 2.0mm
4	Voltage	1.8V~4.4V
5	Temperature	-20～+70 ℃
6	Storage Temperature	-40～+85 ℃
7	Frequency Range	2402～2480MHz
8	Maximum RF Transmit Power	9dBm
9	Receive Sensitivity	-92.5dBm

3.2 Electrical Characteristics

3.21 Absolute Maximum Rating

Rating	Minimum	Maximum
Storage temperature	-40℃	+85℃
Supply Voltage:1.8-4.4V	+1.8V	+4.4V

3.22 Recommended Operating Conditions

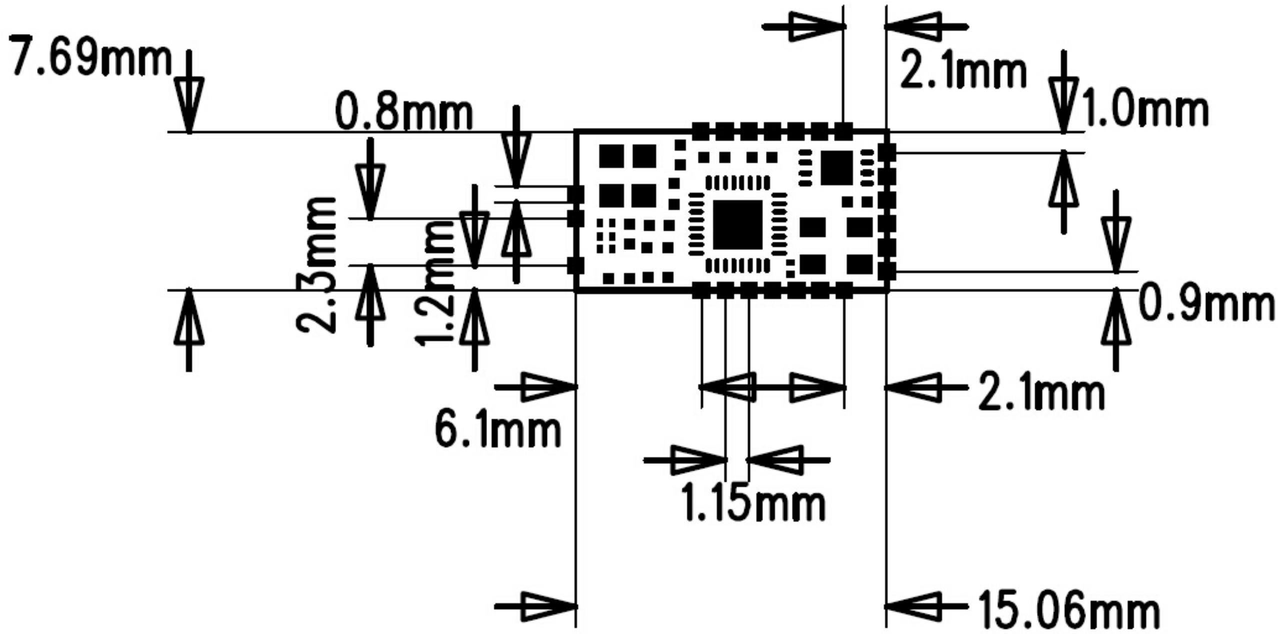
Operating Condition	Minimum	Maximum
Operating temperature range	-30℃	+85℃
Supply voltage: VDD_BAT	+1.8V	+4.2V

3.23 Power Consumption

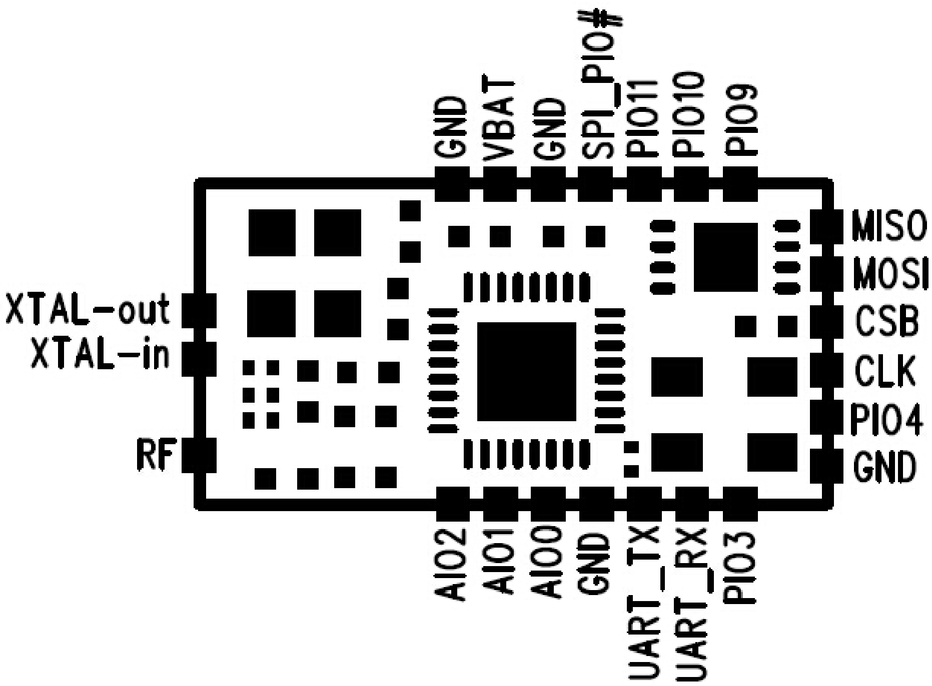
BLE012(CSR1012)	Item	Min	Typ	Max	Unit	Note
State	Working voltage	1.8	3.0	4.4	V	
	Working current	4	130	1200	uA	Peak current
	Standby current			20	uA	
Power supply：3V						

4 Mechanical Dimensions and Electrical feature

4.1 BLE012(CSR1012) module outline:(mm)



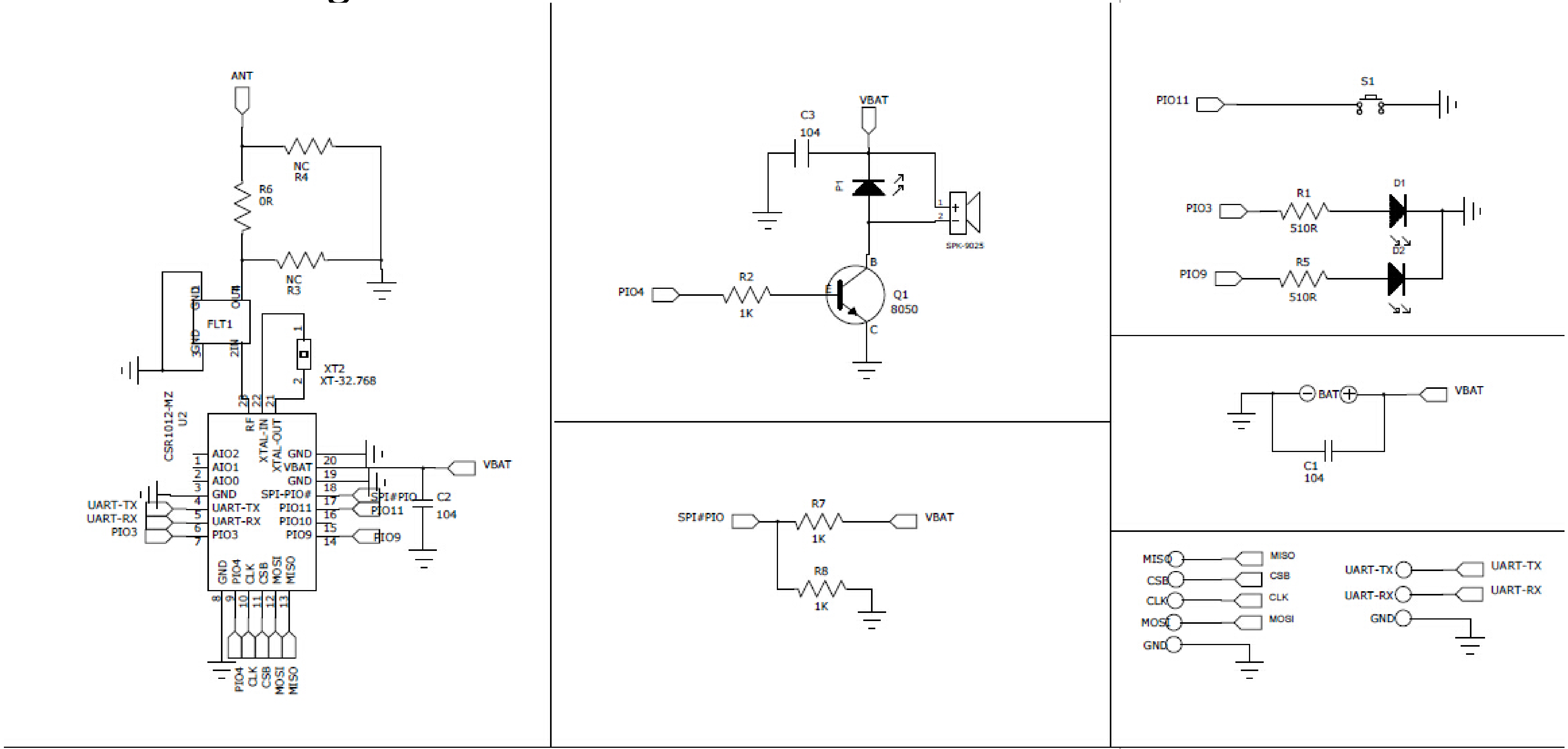
4.2 Package dimensions



4.3 Pin Assignment

Pin No.	Name	Functions	Description
1	AIO2	Bidirectional analogue	Analogue programmable I/O line.
2	AIO1		
3	AIO0		
4	GND	VSS	Ground
5	UART_TX	Bidirectional with programmable strength internal pullup/ down	UART TX
6	UART_RX		UART RX
7	PIO3	Bidirectional	Programmable input / output line
8	GND	VSS	Ground
9	PIO4	Bidirectional	Programmable input / output line
10	SPI_CLK	Bidirectional with programmable strength internal pullup/ down	debug SPI CLK selected by SPI_PIO#. t
11	SPI_CSB		debug SPI chip select (CS#) selected by SPI_PIO#.
12	SPI_MOSI		debug SPI MOSI selected by SPI_PIO#.
13	SPI_MISO		debug SPI MISO selected by SPI_PIO#.
14	PIO9	Bidirectional	Programmable input / output line
15	PIO10	Bidirectional	Programmable input / output line
16	PIO11	Bidirectional	Programmable input / output line
17	SPI_PIO#		
18	GND	VSS	Ground
19	VDD_BAT	Power supply	Battery input and regulator enable (active high).
20	GND	VSS	Ground
21	XTAL_OUT	32.768k Hz Xtal Out	
22	XTAL_IN	32.768k Hz Xtal In	
23	RF	ANT	

5 Reference Design



6 NOTICE-----MOST IMPORTANCE!

This chapter contains important information for the safe and reliable use of the BLE012 module. Please read this chapter carefully before starting to use the BLE012 Module.

6.1 General information

Bluetooth technology, is in fact a kind of short distance wireless communication technology, can effectively simplify the palmtop computer, notebook computer and mobile phone, Mobile Phone and other mobile communication between communication terminal equipment, but also can successfully simplify the equipment and communication between the Internet, so that these modern communications equipment and Internet data transmission between rapidly became more efficient, to widen the road for wireless communication.

6.2 Electrostatic Discharge (ESD)

The following Electrostatic Discharge (ESD) precautions are recommended:

- Protective outer garments.
- Handle device in ESD safeguarded work area.
- Transport device in ESD shielded containers.
- Monitor and test all ESD protection equipment.

7 AT Command Set

If BLE012 module has the AT command settings:

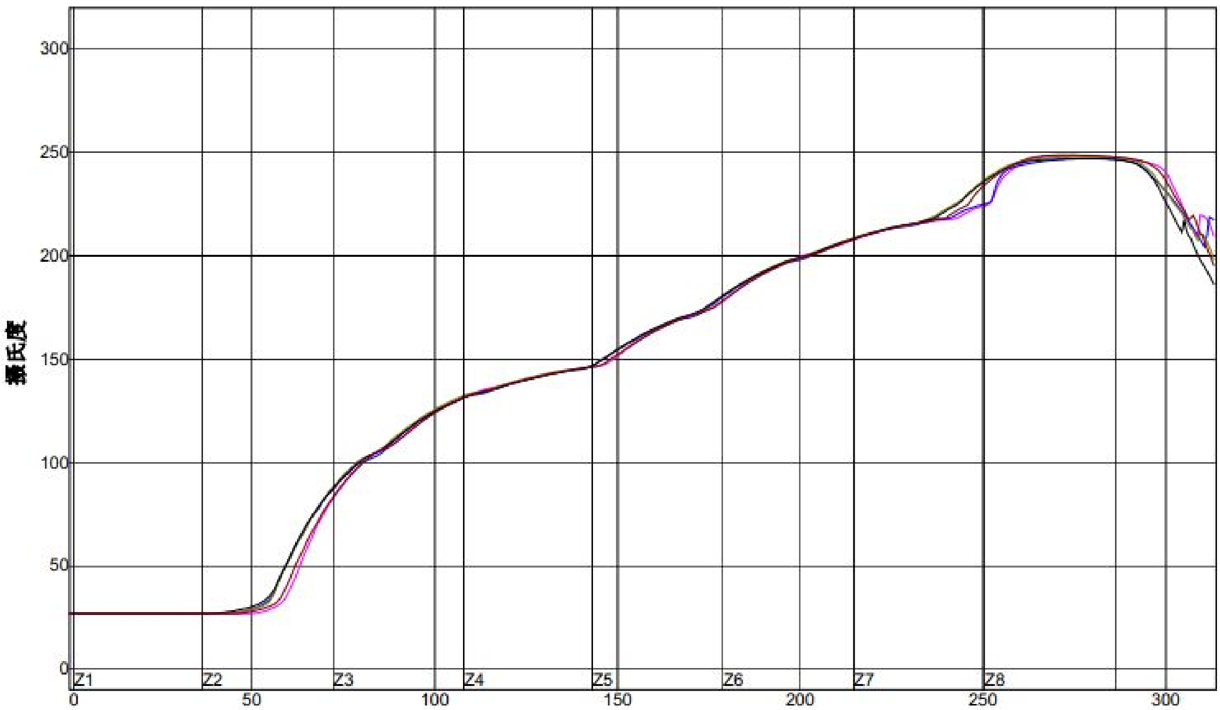
BLE012 AT Command				
Command Format	Power Down Prote-ction	Specification	Returned Value	Descriptions
ASCII: ^AT-Nxxxxx^ Hex: 5E 41 54 2D 4E ***5E	YES	xxxxx is the Bluetooth name of the device ^ is the end mark	Applied successfully: OK Applied failed: ERP	
ASCII: ^AT-MAC Hex: 5E 41 54 2D 4D 41 43	NO	Read the MAC Address of the device	Applied successfully: MAC Data Applied failed: ERP	If setting successfully then return the MAC like: 20 2A 32 34 32 34
ASCII: ^AT-STATER Hex: 5E 41 54 2D 53 54 41 54 45 52	NO	Read the state of the device	Applied successfully: STATER Applied failed: ERP	STATER1: Fast broadcast STATER2: Slow b roadcast STATER3: Linked STATER5: un-linked and ready to answer the link request
ASCII: ^AT-STATEW01 Hex: 5E 41 54 2D 53 54 41 54 45 57 30 31	NO	Set the state of the device	Applied successfully: OK Applied failed: ERP	01 to broadcast state: Make the device go into the broadcast state without matter the current work state
ASCII: ^AT-RATEXXXXXX Hex: 5E 41 54 2D 52 41 54 45 ******	YES	Set the UART speed	Applied successfully: UART speed Applied failed: ERP	AT-RATE002400：2400 AT-RATE115200：115200 Support speed： 2400，9600，19200 38400 115200 230400

Remark:

1. AT Command will be available when the UART open.
2. ^AT-Nxxxxx^ and ^AT-STATEW01 will reset Bluetooth device and make Bluetooth on the broadcast state.
3. Please use ASCII or hexadecimal number format send AT commands

8 Recommended Reflow Temperature Profile

The module must go through 125C baking for at least 9 hours before SMT AND IRreflow process.



PWI= 82%	最高上升斜率		最高下降斜率		恒温时间150至217C		回流时间 /217C		最高温度		总共 时间 /217C	
2	2.58	72%	-1.36	82%	87.43	-9%	72.59	42%	248.61	72%	72.59	42%
3	2.38	58%	-1.45	77%	89.27	-2%	73.13	44%	247.17	43%	73.13	44%
4	2.45	63%	-1.76	62%	87.96	-7%	71.91	40%	248.17	63%	71.91	40%
5	2.39	59%	-2.09	45%	87.88	-7%	68.87	30%	247.17	43%	68.87	30%
6	2.50	67%	-1.85	57%	87.88	-7%	72.15	41%	248.90	78%	72.15	41%
温差	0.20		0.73		1.84		4.26		1.73		4.26	

9 Related recommended

● Full metal shell will greatly shorten the Bluetooth transmission distance
● Bluetooth antenna below PCB plate not coppe

10 Document History

Revision	Date	History
V1.0	2013-12-09	First release
V1.2	2015-02-10	Renew the AT Command set